SECTION 5
SOCIAL COST-EFFECTIVENESS ANALYSIS

The social cost estimates from the market analysis and the estimate of traffic coating user costs can be used to compute measures of the social cost-effectiveness of the regulation. The distinction of "social" cost-effectiveness is made to illuminate the fact that the costs evaluated are the net costs imposed on society, i.e., the net welfare costs estimated in the architectural coatings market plus the resource costs incurred by traffic coating users to switch application equipment.

The measure of social cost-effectiveness is computed as follows:

$$SCE = (|)WF| + TMEC)/|)E|. \quad (5.1)$$

|)WF| is the absolute value of the aggregate annual net change in welfare (i.e., total social costs), summed across all markets in the market analysis. TMEC is the annualized traffic marking equipment costs, and |)E| is the absolute value of emission reductions. The |)WF| of 20.2 million is produced by the market model. The TMEC value is estimated at $3.7 million in the previous section and is adjusted to $3.3 million (1991 dollars) for comparison with the market results, leading to a total social cost estimate of $23.5 million. For external reporting purposes, all numbers will be converted to 1996 dollars later in this section.

The emissions reduction estimate needs some elaboration. To correspond with the cost estimates, a national estimate of emissions reduction must be used. The baseline estimate of national VOC emissions from regulated architectural coatings products is 509,900 Mg.[a,66] Given the reduction of 20.6 percent in 1998, the aggregate emissions reduction in 1998 is 105,075 Mg, which is ΔE^T. However, the emissions target must be adjusted by two market-related factors: foregone emissions reduction due to selecting the fee option and changes (net reduction) in emissions due to regulation-induced changes in industry output.

The first adjustment, ΔE^{FR}, was computed by taking the total quantity of "exceedance" emissions for products electing the fee option. These targeted emissions reductions will not be accomplished because of the fee option:

$$\Delta E^{FR} = (\Delta E_S^{FR} / \Delta E_S^T) \bullet \Delta E^T. \qquad (5.2)$$

The second adjustment was computed by taking the ratio of the change in industry output to baseline industry output and multiplying by baseline industry emissions:

$$\Delta E^Q = (\Delta Q / Q_0) \bullet E_0. \qquad (5.3)$$

ΔQ is the change in industry output, which is the sum of market-level changes, Q_0 is baseline industry output (2.375 billion liters), and E_0 is baseline emissions (509,000 Mg indicated above).

Thus, the net emissions reduction is computed as follows:

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[a]This estimate is based on a national baseline emissions estimate provided by Eastern Research Group of 560,900 tons, which is converted to Mg by multiplying by the ratio of tons/Mg = 0.9072. The result is a national estimate of 509,900 Mg.

$$)E =)E^{T} +)E^{FR} +)E^{Q}. \quad (5.4)$$

Absolute reductions are reported in Table 5-1. The net reduction equals the targeted reduction, less foregone emissions reductions (due to fee), plus emission changes due to changes in industry output via regulation-induced market interactions.

The analysis focuses on computing social cost per Mg of emissions reduction based on the market welfare costs and traffic marking coating user costs estimated in the previous sections. Table 5-1 presents the results. The social cost-effectiveness estimate is $247/Mg.

This estimate allows for an evaluation of cost-effectiveness implications of the fee option. Allowing the fee reduces social costs (compared to the static national reformulation cost estimate of $34 million) by about $12 million but foregoes about 1,802 Mg of emissions reduction, about 1.7 percent of the targeted reductions. Dividing the cost savings by foregone reductions approximates the marginal social cost of the foregone reductions. This figure is $6,580/Mg, which is substantially higher than the $247/Mg average social cost-effectiveness measure reported in Table 5-1. This indicates that the fee's main effect is to reduce the most expensive emission reductions.

An important implication of these estimates is that the fee option, while leading to a substantial reduction in the social costs of the regulation, does not significantly undercut the emissions reduction target. Moreover, by charging the VOC exceedance fee, firms that opt for the fee have a continued incentive to achieve marginal reductions in VOC content.

TABLE 5-1. SOCIAL COST-EFFECTIVENESS ESTIMATES

Social Cost: Architectural Coatings Market ($1991)	Traffic Coating User Costs ($1991)	Total Social Cost ($1991)	National Emissions Reduction[a] (Mg)	Estimated Foregone Emissions Change[b] (Mg)	Estimated Market Output Adjustment[c] (Mg)	Net Emission Reduction[d] (Mg)	Social Cost per Mg ($1991)
22,319,063	3,269,994	25,589,057	105,075	1,802	198	103,471	$247

[a] National estimate of baseline emissions (509,900 Mg) times 0.2061 (estimated proportional emissions reduction in 1998).

[b] National emissions foregone due to adoption of exceedance fee, as estimated in architectural coatings market model.

[c] Baseline emissions times ratio of industry market quantity reduction to baseline industry output.

[d] Net emissions reduction = targeted reduction – foregone reduction + quantity adjustment.

5.1 CONVERSION OF IMPACTS TO CURRENT DOLLARS

As indicated previously, all impacts presented in the analysis are in constant 1991 dollars. Some commenters indicated a preference for values to be expressed in more recent years. Therefore, this section provides a demonstration of how 1991 dollars can be converted into a value closer to the current year. This conversion is performed using the 3GDP price deflator. At the time of this analysis, the most recent year of data was for 1996; thus a conversion is provided for 1996. Given that the GDP index in 1991 is 97.4 and in 1996 the index is 111.0, a conversion factor of 1.1397 can be applied to any value in the report. Table 5-2 demonstrates the conversion to 1996 dollars. The estimated annual net social welfare cost of the regulation of $25.6 million in 1991 dollars converts to $29.2 million in 1996 dollars. Thus, social cost-effectiveness estimate converts from $247 Mg ($1991) to $282 Mg ($1996).

TABLE 5-2. CONVERSION OF SUMMARY IMPACTS TO 1996 DOLLARS

Impact Estimate	$1991	$1996
Net social cost	$25.6 million	$29.2 million
Net social cost per Mg of emissions reduction	$247/Mg	$282/Mg

66. Eastern Research Group. “Emission Reduction from the Final Architectural Coatings VOC Rule.” Prepared for the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Morrisville, NC: Eastern Research Group. 1998.